

Committee on Earth Observation Satellites
17th Plenary Meeting
Colorado Springs, Colorado
November 19-20, 2003

CEOS/17/Agency Report:
DLR

Item 19.3

Country Report from Germany by DLR (German Aerospace Center)

SUMMARY AND PURPOSE

Herewith DLR provides an update on German Space activities.

ACTION PROPOSED

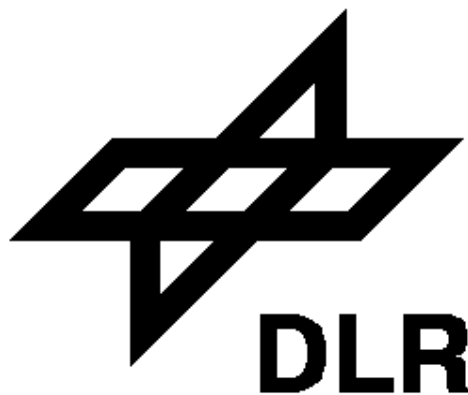
The meeting is invited to take note of the information contained in this document.

Significant Events since last Plenary

Report of the German Aerospace Center (DLR)

17th CEOS Plenary meeting, Colorado Springs

November 2003



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1.) General

Highlights in the Earth Observation Programme of DLR since the last CEOS plenary meeting in November 2002 were:

- continuous successful operation of the
 - BIRD satellite
 - SCIAMACHY instrument onboard ENVISAT
 - GRACE-mission
 - MOS instrument onboard IRS-P3
 - ground segment of PRARE onboard ERS-2
 - CHAMP satellite
- continuous processing and release of SRTM data
- continuous preparation of:
 - TerraSAR-X
 - RapidEye
- Release of a national call for proposals for a future Earth Observation Mission
- running the data utilization programme for new applications in agriculture, forestry, monitoring of the environment, atmospheric chemistry, early warning of catastrophic events and humanitarian aid, including scientific and application oriented data utilization projects for ERS-2, ENVISAT and preparatory work for future missions like TerraSAR-X and within the European Earth Explorer Envelope Program regarding data validation and utilization

The progress made in national programme activities is described below. For detailed technical information please look at the recent published CEOS Earth Observation Handbook (<http://www.eohandbook.com>) or the different dedicated web-links listed below.

2.) Space Segment

2.1) Current Missions

MOS (Modular Optoelectronic Scanning Spectrometer)

MOS was developed and manufactured by the DLR Institute of Space Sensor Technology to fly aboard IRS-P3 (ISRO). The MOS-IRS instrument was launched successfully on March 21, 1996. Since then, MOS data continuously and successfully are received, processed and archived at Neustrelitz.

More than 7 years of successful operation of MOS will nominally end early 2004.

Main application areas of the MOS-sensor are ocean color, land cover and atmospheric turbidity (examples at http://www.dlr.de/dlr/Presse/Presseinfo/pm09_2003.html).

More information about the MOS instrument on IRS-P3 is available online at: http://www.ba.dlr.de/NE-WS/ws5/index_mos.html

PRARE

PRARE is a space borne two-way two-frequency microwave tracking system operating onboard ERS-2 since May 1995. The routine range and range-rate product generation started January 1st, 1996. Since then

PRARE space and ground segment performance is nominally and a stable operation of PRARE can be expected for ERS-2 life time. For the time being cross-measurements between ERS-2 and ENVISAT are conducted.

More information is available on the Web under:

http://op.gfz-potsdam.de/prare/index_PRARE.html

CHAMP (Challenging Micro satellite Payload for Geophysical Research and Application)

The primary mission goals of CHAMP are:

- improved static gravity field and time variations of the field,
- improved main magnetic field and time variations and
- Ionosphere and neutral atmosphere sounding by radio occultation technique.

More than 3 years after launch the CHAMP satellite is still in healthy condition. The spacecraft's operation and control by its subsystems is, as in the beginning, very good. The power, thermal and telemetry systems have been displaying very robust functionality since launch. The attitude and orbit control system, after a number of software and parameter improvements, is functioning without problems. The gas consumption is very low, at a level of a few grams per day.

All seven science instruments, the NASA/JPL GPS BlackJack receiver, the CNES/ONERA STAR accelerometer, the GFZ Laser Retro reflector, the LETI Overhauser magnetometer, the DTU Fluxgate magnetometers, the DTU star sensors are showing very good performance. The STAR accelerometer radial component's malfunctioning output is corrected by some final empirical functions.

Two orbit maneuvers have been performed in 2002 resulting in a higher attitude of the satellite. With the remaining cold gas on board, another 1 year operation can be secured. So the overall operation period will reach 6 years. An updated final version of the onboard data handling system software has been uploaded and is functioning as expected.

Several CHAMP-only gravity field models have been derived from CHAMP GPS satellite-to-satellite and accelerometer data.

For more information please look at:

http://op.gfz-potsdam.de/champ/index_CHAMP.html

BIRD (Bispectral Infra-Red Detector)

The BIRD small satellite was successfully launched on 22nd Oct. 2001 onboard of an Indian carrier (PSLV) into a circular, sun-synchronous orbit - altitude 568km. With a lifetime of meanwhile two years BIRD even exceeded its goals as a demonstrator mission for monitoring high temperature events world wide by applying innovative remote sensing technology in the infrared range of light: Forest fires in Australia and America were likewise observed as well as volcano eruptions or Bavarian Easter fires.

So BIRD obviously demonstrates the scientific and technological value and the technical and programmatic feasibility of the combination of ambitious science and new, not yet space proofed advanced technology with a small satellite concept under low-budget constraints. Its development was carried out by a very close

co-operation between the DLR study team at Berlin - Adlershof and a team of the Technical University of Berlin lead by Prof. U. Renner.

In addition BIRD-Data very successfully could demonstrate their usefulness to support fire-fighting in several places all over the world and actively contributed to the "International Charter on Space & Major Disasters" (please refer to <http://www.dlr.de/caf/aktuelles/news-archiv/themen/waldbrand2003/waldbrand2003>)

More information is online available:

<http://www.dlr.de/BIRD>

SCIAMACHY (Scanning Imaging Absorption Spectrometer for Atmospheric Chartography)

The SCIAMACHY instrument is a German/Dutch contribution to the ESA ENVISAT mission. SCIAMACHY has been launched on ENVISAT with an Ariane-5 at 1st March 2002. Most of the objectives for the Commissioning Phase (Verification, Calibration, Validation) have been already successfully performed. First very promising scientific results have been already achieved and published. Operational data delivery will start beginning of 2004.

Measuring several trace gases SCIAMACHY will help to improve our knowledge about the stratospheric ozone chemistry, the global impact of tropospheric pollution, the exchange between the stratosphere and the troposphere and the natural modulations of atmospheric composition (e.g. by volcanic eruptions or by solar variations)

More detailed information (including first results) can be found on the Web under:

<http://www.sciamachy.de/#english>
<http://www-iup.physik.uni-bremen.de/ifepage/SCIA/SCIAMACHY.htm>
<http://envisat.esa.int/instruments/sciamachy/>

GRACE (Gravity Recovery and Climate Experiment)

GRACE was selected as an "Earth System Science Pathfinders" (ESSP) mission under US/German leadership. The GRACE mission will provide a new model of the Earth's gravity field at monthly intervals for a period of 5 years. The gravity field models will be used to support studies related to global climatic issues. The GRACE mission will acquire the data for the gravity fields by flying two polar-orbiting satellites in a loosely controlled tandem formation. Variations in the Earth's gravity field will cause the variation of distance between the two satellites to vary. This variation will be measured with high accuracy by a microwave link between the two satellites and measurements of these variations will be used to determine the Earth's gravity field. Participants in the project are:

- University of Texas, USA (PI)
- GeoForschungsZentrum Potsdam, Germany (CoPI)
- Jet Propulsion Laboratory, USA (Technical Management)
- DLR, Germany (Launcher, Mission Operation)
- Astrium GmbH, Germany (Satellites)

The payload consists of:

- Dual One-Way Tracking System (K/Ka band) (USA)
- GPS Turbo-Rogue Receiver (JPL, USA)
- Ultra-Stable Oscillator (USA)
- SuperSTAR Accelerometer (ONERA, France)

After the successful launch of the twin GRACE satellites on March 17, 2002 aboard a Rockot launch vehicle from Russia into a 500 km orbit, the Commissioning Phase (originally planned for 1 month) was completed on May 15, 2003. To stabilize the satellites numerous analyses, software uploads, orbit maneuvers, switching to redundancies and reconfigurations after drop outs had to be performed. At least in March/April 2003 an acceptable stability and performance of the satellites could be achieved.

In December 2002 the GRACE team released its first image that graphically illustrated its sensitivity to changes in the Earth's gravity and confirming the satellites measurement performance. As a part of the instrument and system accuracy assessment, a data set of 111 days has been used to determine a preliminary GRACE gravity model. This initial

model shows a significant improvement over previous models for wavelengths of 500 to 15,000 km and, in this region, it has exceeded, by a factor of 10 to 50, the accuracy achieved using the of gravity measurements collected over the past 30 years. The mission is well on its way to satisfying minimum mission requirements and to surpassing it in some respects. The initial GRACE gravity model has been able to provide remarkable resolution of geophysical features observed directly from space. This model has reduced errors in the geoid model to the centimeter level to wavelengths as short as 500 km. The initial GRACE gravity model has already been shown to enable a dramatic improvement in the altimetric determination of ocean currents. The German Satellite Operations Centre (GSOC) at DLR Oberpfaffenhofen is also performing well with over a 95% collection rate of data.

For more information, visit:

<http://www.csr.utexas.edu/grace> or <http://www.gfz-potsdam.de/grace>.

Model images are at:

<http://photojournal.jpl.nasa.gov/catalog/PIA04652>

<http://www.csr.utexas.edu/grace>

<http://www.gfz-potsdam.de/grace>

SRTM (Shuttle Radar Topography Mission)

A 3rd SIR-C/X-SAR mission focusing on single orbit interferometry, called Shuttle Radar Topography Mission (SRTM), was successful launched and operated during 2000, on Space Shuttle. The mission goal was to produce a digital topographic model of the Earth's land surface for latitudes between +60° and -56° with 1 arcsec postings and 10 meter (C-Band) respectively 6 meter (X-band, non-contiguous) relative height accuracy. DLR was responsible for:

- Design and specification of mission and instrument
- Provision of the X-Band interferometer and related Operations System
- Mission operations
- Calibration and validation of the data
- Data processing

The reference data required for the high precision processing have been received from NASA/JPL in June 2001, allowing to start the operational DEM -processing at DLR in October 2001. The data is being processed systematically, continent by continent, block by block and in order to be able to meet the project requirements. The processing order will be Europe, Africa, North-America, South-America, Australia, Asia. At present, all continents have been completed with the exception of Asia. The complete data set will be available by end of 2003. As soon as a region is processed, the data will be available for purchase as 30x30 km tiles with a horizontal pixel spacing of 1-arc-second (30 meters) and a vertical resolution of approximately 6 meters.

More information about the mission is available on the Web under:

<http://www.dlr.de/SRTM>

For data requests as well as the actual status of data processing please refer to:

<http://www.dfd.dlr.de/srtm>

2.2) New Missions

TerraSAR-X

The German Ministry of Education and Research, the DLR and the EADS ASTRIUM GmbH have agreed on an innovative co-operation scheme for the implementation of the advanced SAR-satellite TerraSAR-X by realizing Germany's first Earth observation space project based on public-private partnership with considerable contribution from industry. A corresponding agreement and contract have been signed by the German Aerospace Centre (DLR) and EADS Astrium GmbH (Friedrichshafen) in May 2002. DLR is responsible for the scientific exploitation of TerraSAR-X satellite, while exclusive commercial marketing of the geo-information gathered will be carried out by Infoterra GmbH (Friedrichshafen), a wholly-owned subsidiary of EADS Astrium.

TerraSAR-X is a new generation, high resolution satellite operating in the X-band at 9.65 GHz. The launch of the 1-ton satellite into a 500km orbit is planned on top of a DNEPR-1 rocket for end 2005 and is to be operated for a period of at least 5 years. The project will open a large potential for the scientific utilization of radar data and simultaneously will mark a milestone for sustained commercial exploitation of remote sensing data.

The data/products of TerraSAR-X will also be used to support public interests and the performance of governmental tasks as there are: environmental monitoring, air traffic control, mobile telecommunication services by provision of digital elevation models, regional planning by provision of large scale topographic maps as well as disaster management supported by high resolution data. TerraSAR-X data will also support the EU's GMES-Programme.

By 2007, TerraSAR-X might be integrated into an expanded overall concept called Infoterra/TerraSAR, consisting of both Xband and L-band satellites. The "second frequency" will allow the generation of further thematic information, thus opening up a multitude of further applications. The L-band satellite will be implemented under an ESA project in the framework of the ESA Earth Watch Program.

For more detailed information regarding TerraSAR-X please look at:

http://www.dlr.de/dlr/raumfahrt/rf-management/erdbeobachtung/terrasar-x;internal&action=_setlanguage.action?LANGUAGE=en ;

http://www.infoterra-global.com/terrasar_new.htm

and

http://www.astrium-space.com/corp/programs/index_earth_ob.htm?/programs/part7/0000444.htm

RapidEye

The Company RapidEye AG plans to install a satellite based geo-information service. To be able to serve the identified market segments RapidEye needs to take images of the earth surface in five spectral bands with a resolution of 6.5 m. Key characteristics for the business concept are the daily revisit and the large capacity. This can be achieved by five satellites, each carrying a camera payload with 80 km swath and a rotation capability of up to +/- 30° off-track.

RapidEye AG is busy to perform the envisaged plans. The system of RapidEye shall be functional in 2006 so that after a short commissioning phase the whole vegetation period of the year 2007 can be recorded. Some feasibility questions meanwhile are solved in a frame of a DLR grant.

More information is available on the Web under: <http://www.rapideye.de>

DLR – Call for proposals for a future Earth Observation Mission

Background:

On 15th of April, 2003 the DLR Space Management (RFM) released a call for proposals for a earth observation mission via email to a wider distribution list of the German industrial, scientific and public earth observation and user community. Main objectives of

this call are on one hand the early kick-off of the first planning phases for the next national earth observation mission after TerraSAR-X and on the other hand to let the whole user community participate in this process. Through the development and operations of key earth observation technologies the German space industry should be enabled to gain or to strengthen important positions on the world market of instruments and sensors. The service industry, actually building up strategically important service segments through TerraSAR and GMES, should be enabled to build up further sustainable services through this new mission. The call is addressed to user entities with a strong demand for earth observation data, to elaborate in co-operation with industrial consortia proposals either on a completely German mission, on a German developed earth observation instrument in an international mission or on a German mission, supplemented by an international contribution.

Procedure of the competition:

The teams were asked to submit letters of intent with short descriptions of the proposals until 30th of June, 2003. The complete proposals are due to 3rd of November, 2003. DLR-RFM will evaluate them and select 2 proposals for a phase A study, which will start in 2004. After the completion of these studies, DLR-RFM will decide on the final winner, and initiate the following phases to enable a launch date of the mission around 2009.

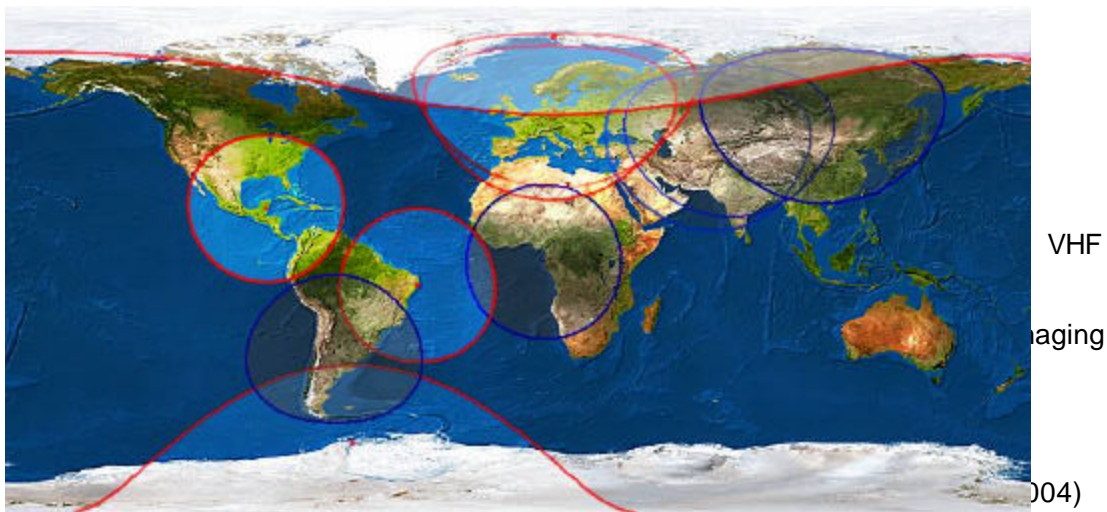
Actual status:

Until 30th of June 16 letters of intent had been received. The main portion of the letters are proposing SAR-missions, followed by optical (Hyper-, Super- and Multispectral) and IR-missions and atmospheric sounders. They are well distributed over the whole range of public, industrial and scientific user categories and are aiming for the application areas atmosphere, meteorology, DEMs, land cover and ocean/ice. 25% of the proposals are aiming for an exclusive German mission, while 75% are looking for a mission in an international co-operation.

3.) Ground Segment

Highlights at the German Remote Sensing Data Center (DFD) are:

3.1.) Data Acquisition



Mobile

Ny Álesund

(with GFZ, Spitzbergen) X-band 4.0 m

Recife (Brazil)

L-band 0.9 m

An actual overview can be seen under:

<http://www.dfd.dlr.de/stations>

The following activities are carried out during the reporting period:

Antarctica : Two data acquisition campaigns have been executed at Antarctic location. During the first campaign, the operational period (30.10.2002 – 26.02.2003) was extended. A half year operation cycle is anticipated during the south-pole summer in the future.

The second campaign has started on September, 28 2003. The primary goal of this activity is to support the GOME sensor on-board of ERS-2, which suffers a problem with

the on-board tape recorder. This campaign shall ensure real-time acquisitions during the development period of the Ozone layer depletion period.

Libreville, Gabon: A final data-acquisition campaign at the Libreville location was executed. The station was disassembled and shipped to Oberpfaffenhofen for refurbishment. It is planned to locate it from 2004 onwards to **Chetumal, Mexico** for a multi-mission support of various EO satellites. The new location has been agreed with the local Mexican authorities and DLR.

Oberpfaffenhofen, Germany: Under contract of European Space Imaging (EUSI) an IKONOS regional operation center (ROC) has been established at the Oberpfaffenhofen site. The station has officially been inaugurated on June 27th, 2003. During the first half year of operation more than 100 passes of the IKONOS satellite were executed and subsequently processed to higher level information products. The data was already used in a Charter call for the Portuguese forest fires in summer this year

Links:

http://www.caf.dlr.de/caf/satellitendaten/missionen/ikonos/_ikonos

http://www.caf.dlr.de/caf/aktuelles/news-archiv/themen/waldbrand2003/_waldbrand2003

3.2) Data Processing and Archiving for ERS and ENVISAT

German Processing and Archiving Facility for ERS (D-PAF)

The German Processing and Archiving Facility for ERS is operated under ESA contract as part of the ERS ground segment for the processing and archiving and user services for ERS tracking data, radar altimeter data (archive only) and SAR data, in addition since the launch of ERS 2 also for the processing and archiving of GOME total ozone columns. SAR data are processed up to the level of terrain corrected geocoded images. Delivery of data to scientific and commercial users takes place via media (mainly CD-ROM, Exabyte) and via electronic links.

Through its co-operation with the GeoForschungsZentrum Potsdam (GFZ), DPAF co-ordinates the international Laser Tracking Network and systematically generates Preliminary and Precise Orbits for the ERS-2 spacecraft.

German Processing and Archiving Centre for ENVISAT (D-PAC)

Within the Payload Data Segment of ESA's ENVISAT mission, DFD hosts the German Processing and Archiving Centre. After the end of the Commissioning Phase and further preparatory activities, the data distribution to ASAR scientific and commercial users started in the 2nd quarter of 2003. Since begin of 2003 Cal/Val users of the atmospheric instruments are still supported with data for their ongoing activities, as diverse problems have delayed the release of atmospheric products to the general public. As of September 2003 MIPAS data up to Level 2 are available.

The general tasks of the D-PAC are:

- processing, archiving and user service provision for ASAR data
- processing, archiving and user service provision for the atmospheric instruments SCIAMACHY, MIPAS and GOMOS. The latter will be performed in collaboration with the Finnish Meteorological Institute (Fin-CoPAC at Sodankylä Arctic Research Center).

The D-PAC will off line process the following Envisat PDS products:

- The ASAR High Rate level 1b products
- The SCIAMACHY and MIPAS level 2 products

The D-PAC will archive the following Envisat PDS products:

- The ASAR High Rate level 0 products
- The ASAR Medium Resolution and Browse products
- The ASAR Wave level 1b and level 2 products
- The SCIAMACHY products of all levels
- The GOMOS level 1b and level 2 products
- The MIPAS level 1b and level 2 products

In addition to its ESA functions the D-PAC will process and archive ASAR and MERIS data from its network of National and Mobile Stations. The data reception of MERIS at Neustrelitz Station started in May 2003. Now regularly two passes per day are acquired.

DFD also is part of the EMMA Consortium for the global distribution of ERS and ENVISAT data, and will provide a wide range of value added products and services as a national task.

ENVISAT Value Adding Products

In addition to its role on behalf of ESA the DFD will provide a wide range of products generated under national responsibility to serve the user community with higher level value added products. These will be generated within the scope of the DIMS system of the DFD (Data and Information Management System), a multi-mission environment for processing, archiving and order management. Unfortunately due to the delay in the availability of some of the underlying ESA basic products these value-added products could not all become available from the end of 2002 onwards as originally planned.

The products will cover aspects of atmosphere, land, ocean and ice, and are detailed below:

Atmosphere:

(NRT services for MIPAS derived products from October 2003 onwards on the web)

- Daily global 3D maps of trace gases
- Vertical profiles of trace gases at selected locations
- Time series for selected locations
- Monthly climatological average maps
- Aerosol and cloud product

Land (ASAR):

(ASAR derived products available on request)

- Coherence maps, Interferograms
- Digital elevation models (DEMs)
- Ellipsoid geocoded images enhanced by DEM use
- Terrain geocoded images
- Mosaics
- Multitemporal images (at a later stage)

MERIS regional products:

(currently only available internally to a German research project, public release planned in 1st quarter 2004)

- Land cover classification of Germany
- AVHRR-compatible vegetation index (NDVI)
- Water content: Chlorophyll and yellow substance optimized for coastal regions of the North and Baltic Sea

- Cloud parameters (height, albedo, optical thickness)
- Atmospheric parameters (water vapor content, aerosols in coastal regions)

Ocean/Ice:

- applications to exploit the ASAR wave mode (in development)

A product description will be made available on the DFD web page during the 4th quarter 2003. For more information and updates on the progress see:

<http://www.caf.dlr.de/caf/satellitendaten/missionen/envisat>

3.3) Multi-Mission Processing and Archiving

Data Information and Management System (DIMS)

DIMS is a system which controls the production and handles the (long-term) archiving and cataloguing of remote sensing data and products from multiple missions and sensors. Furthermore it supports the searching for remote sensing products, their ordering and distribution. DIMS is a multi-site system and installed at the DFD sites Oberpfaffenhofen and Neustrelitz.

One of the central parts of DIMS is the product library consisting of a data base based inventory and a robot library based archive. Other components are the production control, the order management and the online/offline product generation and delivery. In the near future MUIS (multi-mission user information services) together with the EOWEB interface will be used as the DIMS user services. MUIS is a development of ESA/ESRIN with contributions from DFD, EOWEB is a DFD development.

The development and implementation of the DIMS was continued especially with regard to implement further functionalities in the framework of the German national TerraSAR-X mission. These add-ons include using DIMS as a full multi-station/multi-user satellite tasking system. Further developments include the capability to use DIMS as a system to control near real time acquisition, processing and distribution tasks for time-critical applications. Also included is now the capability to run distributed archives under one data management framework.

With regard to embedding new mission data, the entire TERRA Modis data sets, acquired at DLR, and airborne remote sensing data have been included into the DIMS archiving and on-line system.

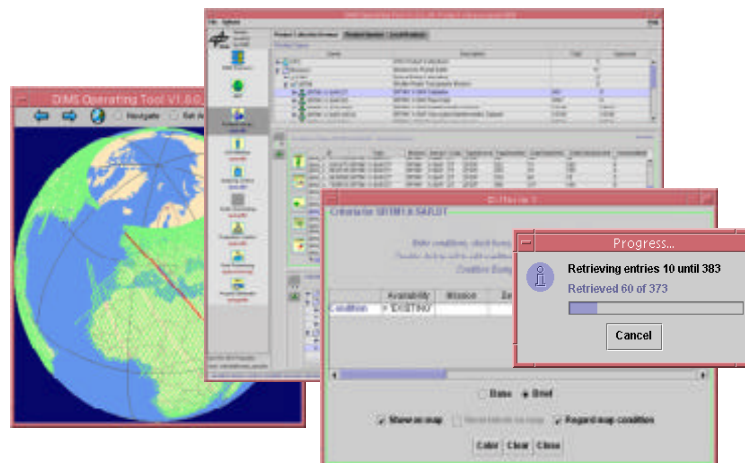


Fig. 1: DIMS graphical operator interface

In order to satisfy the interest of many international partners and companies, DLR has decided to find industrial partners for the commercialization of DIMS. This commercialization will include the licensing of DIMS technology to an industrial partner, as well as selling and maintaining DIMS to external partners. Details of this agreement are currently under negotiation.

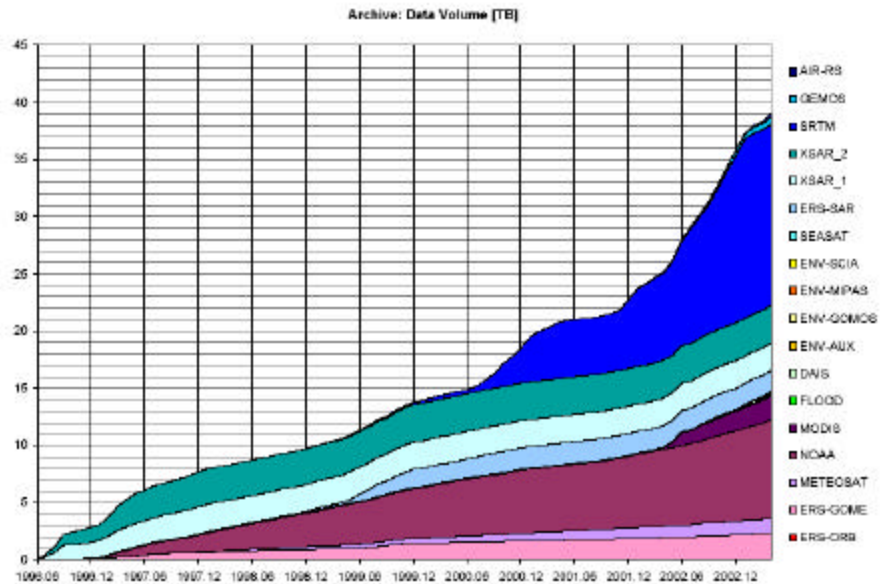


Fig. 2: Data archived with near-line availability under DIMS

The amount of near-line available data has grown in the reporting period and now exceeds 50 TB. Especially the inclusion of the entire SRTM data contributed to the growth of the archive.

3.4) Achievements in the applications fields at DLR Applied Remote Sensing Cluster

3.4.1 - Atmosphere

- Implementation of the new ICSU-World Data Center for Remote Sensing of the Atmosphere <http://wdc.dlr.de>
- *Establishment of a daily information service* of global distribution of atmospheric ozone, ClO_x, NO₂ using ERS-2-GOME and NOAA-TOMS data
- *Establishment of a daily information service* of the distribution of atmospheric H₂O over Europe using NOAA-ATOVS data
- *Establishment of a daily information service* about cloud physical properties over Europe using Terra-MODIS and NOAA-AVHRR
- *Establishment of a daily information service* about the dynamic activity of the atmosphere (Amplitudes and phases of quasi-stationary planetary waves number 1 and 2)
- Implementation of an air quality monitoring and forecasting system for Europe
- *Advanced Total Column Ozone Algorithm implemented for ERS-2/GOME* based on neural networks. The resulting system is being used operationally after a successful validation by ESA. The complete GOME/ERS-2 data set from 1995 to 2003 was reprocessed using these new algorithms
- Initial version of the *UPAS processor for GOME-2/METOP* based retrieval of trace gases was developed. UPAS in conjunction with DIMS are an integral part of EUMETSAT's OZONE-SAF
- MIPAS Level-2 algorithm refined and validated, notably within an EU funded project to compare various European codes, as well as data analysis funded by ESA
- *Verification of SCIAMACHY data processor developments.* In addition, based on commissioning phase outcome, further refinements and improvements for the Level 0-1 and Level 1-2 data processors have been developed and implemented
- The *Virtual Lab (VL)* has been in successful test operation since more than one year. Through a powerful Web-based graphical user interface the VL provides a suite of programmes for electromagnetic

scattering and atmospheric radiative transfer problems to the international scientific community at <http://vl.nz.dlr.de>.

3.4.2 - Land surface

- *Project "CORINE Land Cover 2000"*: Mapping of land use and land use changes in the western part of Germany on behalf of the European Environmental Agency (EEA) and the German Federal Environmental Agency (UBA)
- *Project "Economic and Ecological Restructuring of Land and Water Use in Uzbekistan"*: Establishment of GIS-Center at University Urgench (Uzbekistan)
- *Project "BIOTA"*: Generation of time series of the Leaf Area Index for Kenya based on Earth observation data (MODIS) and integration into the BIOTA-GIS to support biodiversity research in Africa
- *Project "Coal Fires in China"*: Mapping of land cover for coal fire areas in Northern China and development of new algorithms for the automatic detection of coal fires. Field campaigns for verification of research results
- *Project "SPIN"*: Development of spatial indicators for environmental mapping based on Earth observation data
- *SRTM DEM Processing continued*. The SRTM data from the 2000 mission are now completed for most of the world except for the biggest parts of Asia. The current status can be viewed at www.dfd.dlr.de/srtm
- *Forest Damage Assessment*: Mapping of forest damages due to severe storms in Bavaria based on high resolution IKONOS data in co-operation with the forest administration
- *Subsidence Monitoring*: Mapping of mining induced subsidence by means of differential SAR interferometry
- Generation of digital terrain model from SPOT5/HRS data in the framework of a joint ISPRS/CNES test program
- Permanent Scatterer Method was used to determine subsidences for urban areas from a set of approx. 50 ERS scenes
- Software package for geo referencing of airborne scanner data was developed, tested and integrated in DLR's 'DATA and Information Management System (DIMS)'

3.4.3 - Oceans

- *IRS-MOS Mission*: continued successful work with receiving stations of DLR (Neustrelitz), ISRO (Hyderabad), ESA (Maspalomas) und NASA (Wallops Island)
- *Test-Implementation of the ENVISAT-MERIS Value-Adding Processor* for regional Level-2 and Level-3 Products, first examples include the Baltic Sea, North Sea and lake Constance (in cooperation with GKSS, Geesthacht), a validation campaign is currently being carried out.
- *Global Analysis of ERS Wave mode* Data for the identification of freak waves. This activity will lead to a 10 year analysis for the identification of giant waves.

3.4.4 - Other

- Official opening of *DLR's School_Lab* providing education and training facilities in Earth Observation, Digital Image Processing and Computer animation
- *International Charter on "Space Major and Major Disasters"*: Project Management for Charter Call on Forest Fires in Portugal. A press release and more information can be found at www.dfd.dlr.de
- *ESA GMES Service Elements (GSE)*: Participation of DLR in the ESA funded GSE projects "Forest Monitoring" and "SAGE" with significant contributions in the field of infrastructure analysis
- *EU Network of Excellence GMOSS*: Project lead in the newly established Network of Excellence "GMOSS" on Global Monitoring for Stability and Security in the EU 6th Framework Programme

For more information please refer to: <http://www.dfd.dlr.de>